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# Chemistry and Information Literacy for Informed Citizens: Creating and Implementing a Chemistry Research Assignment Using News Media

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In an undergraduate chemistry research assignment, students used popular media to explore science in the news and connected the science media reports to the original scientific literature. A librarian and chemistry instructor collaborated on information literacy instruction to teach students the research skills required to successfully complete the assignment. Students participated in three scaffolded library lab activities: a pre-reflection exercise in which students were asked to articulate what they knew about scientific information and how they would conduct a search for scientific literature; a Google search activity on finding credible science news reports; and an exercise linking science found in popular news reports to the original scientific literature located in academic databases. Learning outcomes assessment is provided in qualitative summaries detailing student interactions with the library lab activities and class discussions.

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## Introduction

Popular media can be used as a hook to introduce undergraduate chemistry students to scientific literature. In the course *UCOR 1810 Chemistry for the Informed Citizen,* a class offered at Seattle University (*1*) and designed by Emily Borda (*2*), students explored science research topics in the media and connected the science media reports to the original scientific literature. Students participated in a library instruction session where they learned the information literacy skills necessary to complete the research assignment.

The Association of College and Research Libraries (ACRL) defines information literacy (IL) as an individual's ability to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (*3*). Commonly, IL is integrated into undergraduate science curricula with the aim to help students strengthen critical thinking in science and become lifelong learners. ACRL's *Information Literacy Standards for Science and Engineering/Technology* is used as the prominent guideline for library instruction in the sciences and addresses the issue of teaching critical thinking and lifelong learning (*4*).

The benefits of integrating IL instruction into science curricula are described in the literature. Holden reported science students show an increase in positive attitudes toward the relationship of science literacy and lifelong learning after having IL instruction incorporated into science courses (*5*). When science instructors and librarians collaborate to teach science literacy in conjunction with information literacy, they work toward a shared goal of teaching students how to be lifelong learners (*6*). Brown and Krumholz described how critical thinking and lifelong learning are typically taught by helping students search for, select, and evaluate scientific literature (*7*). Exposing undergraduate science and nonscience majors to scientific literature has been explored through methods including connecting scientific literature to experimental lab design (*8*) and helping students examine scientific literature in order to effectively communicate scientific concepts and data (*9*).

While evaluating and understanding scientific literature remains a target literacy competency for undergraduate chemistry students, requiring students to focus solely on scientific literature presents a challenge for those students who are unable to relate directly to the literature or who have not yet been taught how to read and process dense scientific information. Scientific knowledge and chemistry literacy can be strengthened by exploring additional forms of science information. Gaining science literacy through evaluating science in the news and popular media can help build reading literacy, strengthen critical thinking, and play a role in students becoming lifelong learners. Majetic and Pellegrino described how lifelong science literacy includes the ability to understand how science research is presented in the media, a skill that many undergraduates lack (*10*). Additionally, Murcia found that undergraduate students lacked the ability to critically engage with science media reports and had little knowledge of how science is connected to a broader social community (*11*). Despite students' low competencies in engaging with science media reports, using popular science news to teach science literacy greatly contributed to students' overall understanding of scholarly scientific literature (*10, 11*).

A study of science faculty and librarians in Ireland noted that faculty across science disciplines *believe* students' ability to develop information literacy comes from the students' personal interest and motivation regardless of the pedagogical structure (*12*). The study further states, students' failure to develop information literacy is largely due to their personal decision to not practice the necessary skills (*12*). However, this chapter describes an alternative approach in which the instructors have assumed the responsibility to inspire and encourage student literacy. Exploring popular media can engage students' interest, helping them to remain focused and to participate. Majetic and Pellegrino reported on teaching science to non-science majors using popular media science reports, "Our approach appears to create a "low-pressure" environment in the classroom, which seems to render the science presented in news articles less intimidating and results in students who are more willing to engage in examining scientific papers" (*10*). Similarly, studying science reports in popular media helps students develop their personal interests in science, which is different from telling students what they are required to know about science (*13*). From this perspective, directing instruction to meet students' personal interests can increase the likelihood of lifelong learning in the sciences.

## The Research Assignment: *Analyzing Media Reports of Scientific Research*

The final research assignment for UCOR 1810 titled, *Analyzing Media Reports of Scientific Research,* is designed to give students a sense of the wonders and complexity of chemistry in the environment. The assignment is a group project that includes a final presentation on chemicals in the environment. Students are put into teams and assigned a news topic and a set of chemicals. In addition to the group portion, students are individually required to write their own research paper that covers a science topic and an associated chemical that ties into the shared group topic. Examples of current news topics and their corresponding chemicals include:

- Climate change in connection with black carbon or nitrous oxide
- Mental health and anti-depressants: flouxentine, duloxetine
- Recreational drugs and stimulants: nicotine, methamphetamine
- Life in space and organic molecules: adenine, guanine, uracil

Working individually, students must first search the free Web to find news reports about their assigned chemical and then search for original scholarly research to support claims read in the popular media. In their research papers, students address the issues presented in the media report in connection to their chemical and the scientific literature. Then, as a team, students work to identify and understand a scientific model of a chemical property. The group compiles an annotated bibliography and delivers a presentation which includes a presentation abstract. In summary, individual and group assignment requirements are as follows:

1. Write a research paper using popular news media and scholarly articles that discuss chemicals in the environment (Individual)
2. Find and explain a scientific model of a chemical property (Group)
3. Compile annotated bibliography of media reports and scientific literature (Group)
4. Research Microsoft PowerPoint presentation, includes presentation abstract (Group)

Table 1 illustrates the information literacy learning outcomes for this assignment and the assessments used to evaluate student comprehension.

*Table 1: Information literacy learning outcomes and student assessment*

<table>
<tr><th colspan="2">Information Literacy<br>Learning Outcomes</th></tr>
<tr><td>Students learn to:<br><br>Search for, discover and select resources for researching basic chemical information and popular media reports.<br><br>Evaluate information based on authority, purpose and reliability.<br><br>Identify the characteristics between quality popular media reports and poor popular media reports.<br><br>Find primary sources referenced in secondary sources.<br><br>Cite others’ work and construct bibliographic citations.</td><td>Students understand:<br><br>Authority is constructed and contextual.<br><br>Research is inquiry and searching is strategic exploration.<br><br>The value of academic databases for finding primary, peer reviewed scientific literature.</td></tr>
<tr><th colspan="2">Student Assessment</th></tr>
<tr><td colspan="2">Student competencies of IL learning outcomes are assessed by:<br><br>Observing students interact with open Web and academic database searching.<br><br>Engaging students in discussion on evaluating information types.<br><br>Reviewing student written work and presentations.</td></tr>
</table>

## Collaborating to Integrate IL into Chemistry Assignments

The librarian and chemistry instructor worked together to develop and teach the research components of *Analyzing Media Reports of Scientific Research*. Collaboration began at the start of the term, allowing ample time to write IL segments for the assignment, design a lesson plan and create student worksheets and handouts.

**Co-writing the chemistry research assignment**

The portion of the assignment written by the librarian outlined questions students can use to evaluate media reports (or any information found on the free Web). In addition to locating and selecting information, a key component of IL includes critical evaluation of all types of information, scientific and popular. Current practice in IL instruction attempts to comply with ACRL's *Framework for Information Literacy for Higher Education* which outlines six frames or aspects of IL. The six frames speak directly to students' ability to interact with and understand information in terms of authority, creation process, value, inquiry, scholarship conversation, and exploration (*14*). Using the framework as a guide, questions were designed to help students think critically about chemical information. Ideally, students would become adept at judging works based on these characteristics: authority, content, purpose, voice, and reliability. Table 2 outlines questions students were asked to consider when evaluating popular media.

*Table 2: Surface analysis of media reports using information literacy based evaluation*

| | |
|---|---|
| Authority | • Is the author a scientist or a journalist? How can you tell if the author is considered an expert?<br>• Who published the news?<br>• Does the author mention other experts and reputable institutions that contributed to the information in the article? |
| Content | • Are the results of scientific research discussed? Are the original sources of the scientific research mentioned in a way that you can find the original research? Is the original research peer-reviewed?<br>• If illustrations are used, how do they help explain the science or correlate with the written content? |
| Purpose and Voice | • Is the written language familiar or formal?<br>• Is the information subjective or objective (or a combination of the two)? Is the article written with opinion or bias? |
| Reliability | • Based on the observations made about the news piece, the author, and publishing organization, is the science information discussed in the article reliable and credible? Explain your reasoning. |

In addition to the questions written by the librarian, the chemistry instructor added prompts that question the nature of science (NOS) tenets, seen in Table 3. These questions were distributed to students and discussed during chemistry class lectures. Daniel Domin explains why integrating NOS tenets into science courses is essential (*15*):

> *Researchers in the field have concluded that through an implicit approach, it is unlikely that students will learn what teachers do not intentionally teach by simply engaging in science activities or by exposure to historical episodes … Rather students' NOS views are best developed in content-based courses … using an explicit-reflective approach … where the NOS instruction has been built into the course curriculum.*

Combining an analysis of NOS with an information literacy based-analysis gives students a well-rounded, in-depth critical thinking experience that strengthens competency in chemistry education and information literacy.

*Table 3: Analysis of media reports in relation to NOS*

| | |
|---|---|
| Scientific Knowledge | • What scientific hypothesis, theories or laws are mentioned in the article (either explicitly or implicitly)? Is the difference between law and theory made clear?<br>• What new scientific knowledge is presented? |
| Scientific Method | • What information is given about the scientific methods used in the investigation? Who or what were the subjects? How long did the research take? Is there evidence of different scientific methods used for the same investigation? |
| Scientists and Society | • How does the scientific investigation show evidence of creativity or imagination?<br>• What does the research offer to science and society? Does the article discuss benefits or limitations/risks of the research? |

### Co-teaching chemistry education and IL

*Chemistry for Informed Citizens* includes one 2-hour lab session per week. One of those lab sessions was devoted to IL instruction where students met in a library computer lab instead of the chemistry lab room. Library computers were available for every student.

All instruction during library lab, including database demonstrations and facilitating student discussion, was conducted by the librarian. The chemistry instructor answered questions related to chemistry and the NOS tenets, as well as questions regarding the assignment requirements. The librarian and chemistry instructor worked as a team, exemplifying the collaborative nature of the librarian and instructor relationship. The participation of the chemistry instructor during library instruction helped students perceive that library instruction is part of chemistry education. This approach contributes to developing a holistic learning experience where information literacy is integrated into chemistry education.

## The library lab

The library lab session lasted two hours and was divided into three activities. These activities led students through a scaffolded learning process that increased in complexity. Students began with a self-reflection exercise designed to help them examine their understanding of scientific literature. Next, students engaged in a Google search activity to find science news reports in popular media. In the third activity, students learned how to connect the science in news reports to the original science discussed in scholarly articles.

### ACTIVITY ONE: Focusing exercise

To prepare students to think about searching and using information resources, reflection exercises were used to draw students into the learning experience. Students were assured that the exercise was not a test and that they did not have to tell their answers to anyone, but could share with the group if they felt comfortable. The point of the exercise was for students to quietly focus on their individual experiences. Reflection questions included: “When you hear the term, *scientific literature*, what comes to mind?” and “If an instructor asks you to find an article from the scientific literature but does not give you any direction on how to do so, what would you do?”

After giving students a few moments to consider their thoughts, students were asked to share with the class. Responses to these questions varied. In response to what students think *scientific literature* is, answers included “peer-reviewed articles” and “articles found in journals”. Students shared that journals are different from magazines, though differentiating between the two is sometimes difficult.

In response to how students would locate scientific literature, some students shared they might begin their search in Google but admitted the number of results would be overwhelming and they would have to guess at what resources are acceptable to use. Other students indicated they would search Google Scholar but would feel stuck if Google Scholar did not provide the full article. One student shared that even though Google Scholar may have scholarly articles, the results are confusing and hard to read. Students also shared that they would consider using the library's academic databases but were not sure which databases to use or how to find them on the library website.

To conclude the reflection exercise, students were encouraged to keep their ideas in mind while completing the library activities.

### ACTIVITY TWO: Effective Google searching

The second activity was a hands-on Google search designed to train students to critically think about their search queries, intelligently read Google results, effectively refine searches, and choose appropriate sources.

Studies indicate that free Web searching, specifically the use of Google, is the preferred search method for undergraduate students. Fast and Campbell reported students generally preferred searching the free Web over using the university's OPAC (online public access catalog) even though they knew of the issues related with questionable search results on the free Web (*16*). In a study on first year applied science students' use and views on finding information, Wilkes and Gurney concluded that nearly 70% of surveyed students prefer using the Internet to find background and scientific information (*17*). Google and Google scholar were the top two choices for preferred Internet use (*17*). Interestingly, in a 2014 study of undergraduates use of Google and federated search tools, Georgas reported students generally believe they are skilled researchers and users of Google even though student search behaviors do not support that belief (*18*). Students did not examine Google results before selecting suitable sources. Likewise, students did not investigate metadata to improve searching (*18*). Instead students relied on information that surfaced on the first results page such as commercial sites and content farms like About.com *(18)*. Georgas reported "Students in this study seemed to have little conceptual understanding of how information is structured and how searches work in either Google or the federated search tool …" (*18*). Georgas' findings help build a case that teaching students to intelligently search for and select quality sources on the free Web and in proprietary academic databases continues to be a necessary component of library instruction for undergraduates.

Students in the library lab were asked to perform a series of Google searches, as illustrated in Table 4. The tasks were designed to help students observe aspects of Google search results and the types of information retrieved from basic searches. Students were encouraged to test various search terms with the goal of being able to understand the differences between natural language and keyword or phrase search queries. During this process, students evaluated individual sources by answering questions about authority, content, purpose, voice, and reliability, as shown in Table 2.

*Table 4: Google search exercise tasks 1-3*

<table>
<tr><th colspan="3">Google Search Exercise</th></tr>
<tr><th>Task 1</th><th>Task 2</th><th>Task 3</th></tr>
<tr>
<td rowspan="3">In the Google search box type: aspirin<br><br>A. Examine the results list and consider:<br><br>What does the Website and domain of the first result tell you about the source?<br><br>What other types of results are on the first page? Look at the titles, URLs and descriptions for information.</td>
<td>In the Google search box type: how aspirin works<br><br>A. Look at the aspree result.<br><br>Who is the author? When was this site published? Can you tell what aspree is?</td>
<td rowspan="3">In the Google search box type: aspirin. Under the search box select the news link.<br><br>A. View the results list and notice source type.<br><br>Which sources are newspapers, blogs, commercial sites, etc.?<br><br>In your opinion, are these quality sources?<br><br>Are any of these results quality science media sources?</td>
</tr>
<tr><td>B. Look at the HowStuffWorks result.<br><br>What is this site selling? Can you find an author's name or publication date? What information is on the "About Us" link? Does the article have references at the end?</td></tr>
<tr><td>C. Look at the Wikipedia article on Aspirin<br><br>Can you find a section on how aspirin works? When was this article last updated? Do the illustrations have descriptions? How much of this article is written with facts? Can you detect bias? How can you tell if the references are credible?</td></tr>
</table>

While students completed the activity, the librarian and chemistry instructor observed the class execute searches, answered questions related to Google results, and offered suggestions for identifying quality news sources. The librarian observed that students tended to select a source from the first page of results and rarely looked beyond the first page to find sources that could be more suitable to their needs. It was observed that when students did not see a useful source on the first page of Google results, they tended to execute a new search. When students were asked how they could learn more about the purpose and credibility of a Website, the librarian observed that students had difficulties locating a Website's "About" section. However, students easily identified URL domains and commented that they understood the commercial nature of .com sites as being distinct from .gov or .edu cites. Students commented they did not know how to find the credentials of news article authors. In response, instructors suggested searching for authors in Google to find the author's history in journalism or scientific research. After students completed the Google search activities, the librarian *briefly* demonstrated the search exercises to point out how to identify the "About" pages. Additional tips for refining search results such as adding dates and using synonyms were covered during the demonstration.

Class discussion time was used to explore the unique characteristics and differences between personal blog posts, Websites used for commercial, political, educational, scientific or entertainment purposes (to name just a few purposes), video sources, and the pros and cons of using Wikipedia. Students voiced concerns about Wikipedia's credibility and did not understand when Wikipedia might be used as an acceptable starting point for basic information. Students wanted to know, for example, how to determine if the model of the aspirin molecule shown in Wikipedia was correct. In response, classmates suggested comparing the model with a more reputable source but were not sure where to look on the free Web for such a source. The librarian offered options such as the National Library of Medicine site PubChem or the reputable ChemSpider as alternative free Web resources that can be used to learn more about molecular information. This discussion led to students understanding the importance of evaluating authority and why comparing claims and ideas with multiple sources is essential in helping identify the differences between poor and high quality sources.

Incorporating a discussion component into the library session helps build a community of learners who discuss their discoveries, leading to higher competencies and knowledge creation. When students engage in conversation they shift from passive to transformative learning (*19*). Pankl and Coleman stress that dialog is a critical and necessary component to bridging information seeking with knowledge creation (*19*). The authors state that the research process must present itself within a rhetorical context where discovery and dialog are present: "'Static' information seeking only leads to flat and perfunctory research and contributes very little to the growth of the researcher's intellectual identity. Thus, the mutability of purpose is perhaps the most significant concern within the context of IL; without it, dialog and discovery are unlikely to occur" (*19*). This process contributes to a chemistry student's growth in becoming a lifelong learner and contributor to science discovery and creation. By sharing with their peers what they discovered during the Google searching activities, including what they found surprising or inspiring and what remained challenging or confusing, students made real life connections between their personal experience and a larger social structure.

**ACTIVITY THREE: Bridging to academic databases**

One of the more challenging and time consuming tasks students encountered in this assignment was finding quality news articles that referenced original research. When students were asked to share with the class how to pull citation information from reputable news sources, some students mistook hyperlinked text in news reports and blog posts to be links to cited references. News reports including bulleted lists of links on where to "find more information" were also mistaken for links leading to original research. To correct this error, students were taught to look for citation clues, such as author names, dates, or scholarly article titles that can be used to track down original research. Once students located a reputable media report and identified citation information, they were ready to transition to the final activity on searching academic databases.

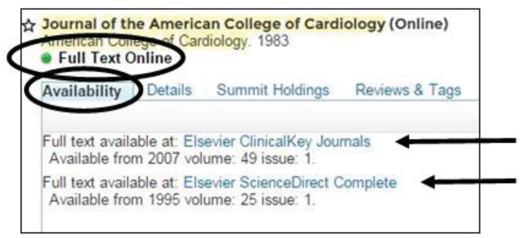
Students were given two options for proceeding in this third activity. In option one, students could explore interdisciplinary databases such as Academic Search Complete and subject specific databases including ACS Publications to find information related to their topic or to the researchers referenced in the science news reports.

In option two, students who found a science news report that referenced an academic journal title could use the library's federated search tool to execute an e-journal search. Since locating e-journals by title is a valuable skill all students should know, the librarian briefly demonstrated to the class how to search for e-journal titles and read item records in the federated search tool. Figure 1 shows a portion of the instructions students were given on how to navigate from the federated search item record to locating an article. Students had access to Ulrichs Serials Directory and were taught how to locate the peer-reviewed status of journal titles. Students were also directed to Interlibrary Loan services for requesting titles the library did not have direct access to.

Now that you have a journal name, you can see if SU has access to full text. Use the Lemieux Library Journal Search in Primo on the library homepage.


Copy in the journal name into the search box, select **Lemieux Journals** and look for **online access**.

If SU has online access – you will see database links:




Once you are looking at the journal inside the database, you will need more info to track down the primary source. Look for article titles or authors. Use this information to pinpoint the article.

Use Ulrich's to check for peer-review status.

If SU does not have access to full text, request the article using Interlibrary Loan: http://libguides.seattleu.edu/illiad

**Figure 1:** Screenshot from student handout showing instructions on how to locate journal titles owned by Seattle University. (Reprinted with permission from ref 20. Copyright 2015.)

After the e-journal search demonstration, students used the remainder of the library session to proceed with option one or two. Students were set free to search and locate potentially useful information for their assignment. The librarian and chemistry instructor continued to circulate the room, observing student progress, offering suggestions and answering questions. Building on the Google searching experience, students learned to adapt to a new way of finding information in academic databases. For example, student searches demonstrated how a known title or author search in an academic database can lead them to the scholarly article referenced in the news media report. Likewise students discovered a subject search in an academic database delivered an organized list of relevant results, whereas Google results were ordered based on different criteria. Students were able to conceptually understand that search results in Google and proprietary databases are structured differently and that the proprietary databases offer accessible refining options based on specific record fields.

While the third activity was given a generous time limit, students with especially challenging research topics needed more time than the library session allowed to locate potentially useful scholarly articles. However, all students left the library lab equipped with the skills necessary to continue their search. When asked how they would proceed with their research after the library lab, students commented that they felt more confident in their abilities to use the academic databases explored in the library lab for future literature searches.

## Outcomes

Student competencies of IL learning outcomes were assessed by observing students interact with the library lab activities, engaging students in class discussion, and reviewing student work, as described in Table 1. Table 5 displays a qualitative summary of the student competencies observed during library lab activities two (Google search for popular science news reports) and three (locating original scientific literature in proprietary databases). The competency levels in Table 5 are divided into two categories: 1) low to medium and 2) medium to high. The low to medium category suggests students showed little knowledge of the IL skills addressed and required more instruction. The medium to high competency category suggests students showed a higher command and understanding of the IL skills and concepts addressed in the library lab. The indicators should be understood as falling within a spectrum where low competency means the majority of student achievement was weaker and inconsistent, and high competency means the majority of student achievement was stronger and more consistent. The conclusions of the library lab's reflection exercise from activity one are omitted from Table 5 because of the activity's introspective nature.

*Table 5: Student competencies of IL learning outcomes observed through student interaction with class activities and class discussion.*

| | **Students indicated low to medium competency throughout the activity.** | **Students indicated medium to high competency throughout the activity.** |
|---|---|---|
| **Activity Two: Google searching and locating popular science news reports** | Student weaknesses during the library activities:<br><br>Locate a Website's "About" section to learn more about a site's purpose.<br><br>Locate background information about popular science news authors.<br><br>Identify citation information for the original research referenced in popular science news reports.<br><br>Evaluate Web sources based on authority, purpose, and reliability. | Student strengths during the library activities:<br><br>Identify URL domain type and purpose: .com, .edu, .org, etc.<br><br>Read Google results and identify domain types within results list.<br><br>Understand general characteristics of information types found on the Web: blogs, news reports, political sites, educational sites, etc. |
| **Activity Three: Locating original scientific research in academic databases** | Student weaknesses during the library activities:<br><br>Use citation information to search for primary scientific literature in proprietary databases.<br><br>Understand that research is inquiry and searching is strategic exploration. | Student strengths during the library activities:<br><br>Understand Google and proprietary databases are uniquely structured.<br><br>Understand the value of proprietary databases for finding primary scientific literature. |

Considering the outcomes of the library lab, students would benefit from more instruction on identifying citation information in popular science news reports and locating original published scholarly articles in proprietary databases. However, students enjoyed the process of discovering popular science news reports on the Web and commented that they were interested to learn how chemistry is discussed in popular media. Students also liked the process of linking popular science news reports to the original scientific research, even though the task was challenging. By the end of the library lab session, students indicated they understood the importance of reviewing multiple sources to compare scientific claims and ideas. Students also finished the library lab with a strategic plan to continue their research and complete the assignment.

Final average grades for the assignment, *Analyzing Media Reports of Scientific Research* were in the B+ range. Prior to this assignment and library instruction redesign, final average grades from the previous academic term were in the B range. The increase in average grade cannot be solely attributed to the library session or to the fact that the assignment instructions were more directed. Other variables contributing to student final grades and competencies for this assignment included the chemistry instructor spending more time in class discussing NOS tenets, providing students a sample paper as a guide for their final, and distributing detailed grading rubrics for the assignment.

Formal assessments of similar projects are needed to evaluate: (1) students' actual or perceived competencies in their understanding of chemistry in science media and their everyday lives; (2) students' actual or perceived gains in skillset using Google, federated search tools and proprietary databases; and (3) students' actual or perceived gains in ability to evaluate and interpret chemistry information. Formal assessment outcomes can be used to strengthen chemistry and information literacy among undergraduates, as well as spotlight the benefits of librarian and chemistry faculty collaborative efforts.

## Conclusion

This project suggests using popular media as a tool for helping undergraduate science and non-science majors develop chemistry and information literacy is effective. A key component to this success is the librarian and chemistry faculty collaboration. The literature describes how popular science news reports can help students make a personal connection to scientific concepts which can strengthen science literacy. The activities used in the library lab build on this knowledge and provide a means for undergraduate students to learn how original scientific research is displayed in popular science news media.

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Science and Technology, and the College of Engineering at the University of Hawaiʻi at Mānoa.

## References


1. Seattle University. University Core Curriculum. https://www.seattleu.edu/core/the-curriculum/ (accessed June 6, 2016).
2. Borda, E. Chemistry for the Informed Citizen: A Constructivist Curriculum for Non-Majors' Chemistry. Presented at the Meeting of NSF-CCLI/TUES Principal Investigators, Washington, D.C., Jan 2013.
3. ACRL. Information Literacy Competency Standards for Higher Education. http://www.ala.org/acrl/standards/informationliteracycompetency (accessed Mar 17, 2016).
4. ACRL. Information Literacy Standards for Science and Engineering/Technology. http://www.ala.org/acrl/standards/infolitscitech (accessed Mar 10, 2016).
5. Holden, I.I. Science Literacy and Lifelong Learning in the Classroom: A Measure of Attitudes among University Students. *J. Libr. Adm.* **2010,** *50*, 265-282.
6. Oh, J.; Starkey, A.; Kissick, B. Fostering Students to be Lifelong Learners with Science Literacy, Information Fluency, and Communication Skills. *Proceedings of the ASEE 2007 Annual Conference & Exposition,* Honolulu, HI, June 24-27, 2007.
7. Brown, C.; Krumholz, L.R. Integrating Information Literacy into the Science Curriculum. *Coll. Res. Libr*. **2002,** *63,* 111-123.
8. Bruehl, M.; Pan, D.; Ferrer-Vinent, I.J. Demystifying the Chemistry Literature: Building Information Literacy in First-Year Chemistry Students through Student-Centered Learning and Experiment Design. *J. Chem. Educ*. **2015,** *92*, 52-57.
9. Gross, E. M.Green Chemistry and Sustainability: An Undergraduate Course for Science and Nonscience Majors. *J. Chem. Educ*. **2013,** *90,* 429-431.
10. Majetic, C.; Pellegrino, C. When Science and Information Literacy Meet: An Approach to Exploring the Sources of Science News with Non-Science Majors. *Coll. Teach*. **2014,** *62*, 107-112.
11. Murcia, K. Science in the News: An Evaluation of Students' Scientific Literacy. *Teach. Sci*. **2009,** *55*, 40-45.

12. McGuinness, C. What Faculty Think-Exploring the Barriers to Information Literacy Development in Undergraduate Education. *J. Am. Libr*. **2006,** *32,* 573-582.
13. Cakmakci, G.; Yalaki, Y. Popular Media as a Tool for Teaching Science and Its Nature. In *Promoting Student Teachers' Ideas about Nature of Science through Popular Media*, S-TEAM/NTNU: Trondheim, Norway, 2012; pp 1-14.
14. Framework for Information Literacy for Higher Education. 2015. ACRL.http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/Framework_ILHE.pdf (accessed Nov 17, 2015).
15. Domin, D. S. Integrating the Nature of Science into Content-based Science Courses. In *Chemical Education*, Proceedings of the First International Conference on Education in Chemistry, Mumbai, India, Nov 12-14, 2010; Ladage, S.; Samant, S.D., Eds; Narosa Publishing House: New Delhi, India, 2012; pp 17-25.
16. Fast, K.V.; Campbell, D. G. "I Still Like Google": University Student Perceptions of Searching OPACs and the Web. *Proc. Am. Soc. Info. Sci. Tech*. **2004,** *41*, 138-146.
17. Wilkes, J.; Gurney, L.J. Perceptions and Applications of Information Literacy by First Year Applied Scientific Students. *Aust. Acad. Res. Libr*. **2009,** *40*, 159-171.
18. Georgas, H. Google vs. the Library (Part II): Student Search Patterns and Behaviors when Using Google and a Federated Search Tool. *Portal Libr. Acad.* **2014,** *14*, 503-532.
19. Pankl, E.; Coleman, J. "There's Nothing on My Topic!" Using the Theories of Oscar Wilde and Henry Giroux to Develop Pedagogy for Library Instruction. In *Critical Library Instruction: Theories and Methods*, Accardi, M., Drabinski, E., Kumbier, A., Eds.; Library Juice Press: Duluth, MN, 2010; pp 3-12.
20. Waddell, M. Seattle University, Seattle, WA. Excerpt from class handout, 2015.